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MEMO TO : File  
GTL Energy, Ltd.  
GTLE Dakota Plant 1 LLC  
Near South Heart, ND  
Stark County

FROM : Craig D. Thorstenson  
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Division of Air Quality

CDT

RE : Hazardous Air Pollutants

DATE : April 6, 2009

Hazardous air pollutants (HAPs) were quantified in the Air Quality Effects Analysis for the GTL Energy facility. Particulate matter HAPs are expected from coal handling and processing due to trace amounts of HAPs in the coal. In the analysis, it was determined that the concentrations of HAPs in the ambient air are expected to be well below the levels allowed by the Air Toxics Policy based on the low level of HAP emissions and the fact that emissions will be emitted from stack heights of at least 60 feet.

During the public comment period, concerns were raised regarding uranium and other chemicals/compounds in the coal. To determine the ambient concentrations of HAPs expected to be emitted from the facility, the results of the January 5, 2009 dispersion modeling analysis were used to estimate the ambient concentrations of the HAPs as follows (the example shown is for uranium):

Uranium Content (ND Lignite) = 1.4 ppm (mean), 4.3 ppm (max)  
Uranium Content (TX Lignite) = 3.5 ppm (average); 10.2 ppm (max)

Worst-Case Uranium emission rate = 4.49 lb/hr PM x 10.2 ppm = 0.0000458 lb/hr

Modeled PM<sub>10</sub> concentration at 4.49 lb/hr = 11.95 µg/m<sup>3</sup> (24-hour average)

Equivalent 1-hour PM<sub>10</sub> concentration = 11.95 µg/m<sup>3</sup> / 0.4 = 29.88 µg/m<sup>3</sup> (1-hour average)

Uranium Concentration = 10.2 ppm (29.88 µg/m<sup>3</sup>) = 3.05 E-04 µg/m<sup>3</sup> (1-hour average)

Uranium Concentration =  $3.05 \text{ E-}04 \text{ } \mu\text{g}/\text{m}^3 (0.7) = 2.1 \text{ E-}04 \text{ } \mu\text{g}/\text{m}^3$  (8-hour average)

Utilizing the same methodology as above for the other HAPs quantified in the Air Quality Effects Analysis results in the following predicted concentrations:

HAP	Conc. in Coal (ppm)	Predicted Concentration in ambient air ( $\text{mg}/\text{m}^3$ )		Guideline Concentration ( $\text{mg}/\text{m}^3$ )		Hazard Quotient	Factor Below GC
		1-hr	8-hr	1-hr	8-hr		
Antimony	3.3	$9.87 \text{ E-}08$	$6.91 \text{ E-}08$	---	0.01	$6.91 \text{ E-}06$	144,509
Arsenic	32.0	$9.57 \text{ E-}07$	$6.70 \text{ E-}07$		0.0002	$3.35 \text{ E-}03$	298
Beryllium	3.8	$1.14 \text{ E-}07$	$7.98 \text{ E-}08$		0.000001	$7.98 \text{ E-}02$	12.5
Cadmium	0.95	$2.84 \text{ E-}08$	$1.99 \text{ E-}08$		0.00004	$4.99 \text{ E-}04$	2,004
Chromium	54.0	$1.62 \text{ E-}06$	$1.13 \text{ E-}06$		0.0002	$5.65 \text{ E-}03$	177
Cobalt	43.0	$1.29 \text{ E-}06$	$9.03 \text{ E-}07$		0.0004	$2.26 \text{ E-}03$	443
Lead	37.0	$1.11 \text{ E-}06$	$7.77 \text{ E-}07$	*	*	---	---
Manganese	580.0	$1.74 \text{ E-}05$	$1.22 \text{ E-}05$		0.004	$3.05 \text{ E-}03$	328
Mercury	0.50	$1.50 \text{ E-}08$	$1.05 \text{ E-}08$	0.0006	0.0002	$5.25 \text{ E-}05$	19,048
Nickel	57.0	$1.71 \text{ E-}06$	$1.20 \text{ E-}06$		0.002	$6.00 \text{ E-}04$	1,667
Selenium	145.0	$4.34 \text{ E-}06$	$3.04 \text{ E-}06$		0.004	$7.60 \text{ E-}04$	1,316
Uranium	10.2	$3.05 \text{ E-}07$	$2.14 \text{ E-}07$	0.012	0.004	$5.35 \text{ E-}05$	18,692
<b>TOTAL (Hazard Index)</b>						0.096	---

\* The ambient air quality standard (AAQS) for Lead is  $1.5 \text{ } \mu\text{g}/\text{m}^3$  ( $0.0015 \text{ mg}/\text{m}^3$ ) over a calendar quarter. The 8-hour concentration for Lead is approximately 1,800 times below the quarterly standard for lead; therefore, the quarterly lead concentration is expected to be at least 1,800 times below the AAQS.

As can be seen from the above, all concentrations are significantly below the guideline concentrations established by the Air Toxics Policy and the lead concentration is expected to be well below the AAQS for lead. In addition, the hazard index of 0.096 is well below the acceptable hazard index of 1.0 established by the policy.

The maximum individual carcinogenic risk is calculated for those HAPs which are considered known or suspected carcinogens and for which a unit risk factor exists. The results are shown in the following table.

HAP	Conc. in Coal (ppm)	Predicted Annual Concentration in ambient air ( $\mu\text{g}/\text{m}^3$ )*	Unit Risk Factor ( $\text{m}^3/\mu\text{g}$ )	Maximum Individual Carcinogenic Risk
Arsenic	32.0	$5.1 \text{ E-}05$	$4.3 \text{ E-}03$	$2.2 \text{ E-}07$
Beryllium	3.8	$6.0 \text{ E-}06$	$2.4 \text{ E-}03$	$1.4 \text{ E-}08$
Cadmium	0.95	$1.5 \text{ E-}06$	$1.8 \text{ E-}03$	$2.7 \text{ E-}09$
Chromium	54.0	$8.5 \text{ E-}05$	$1.2 \text{ E-}02$	$1.0 \text{ E-}06$
<b>Total</b>				$1.2 \text{ E-}06$

\* Calculated by multiplying the concentration in ppm by the predicted annual  $\text{PM}_{10}$  concentration of  $1.58 \text{ } \mu\text{g}/\text{m}^3$  from the January 5, 2009 Air Quality Impact Analysis.

As can be seen from the above, the combined maximum individual carcinogenic risk is calculated to be  $1.2 \times 10^{-6}$  (approximately 1.2 in a million), which is approximately eight times below the acceptable level of  $1.0 \times 10^{-5}$  (one in one hundred thousand) established

by the Air Toxics Policy. It should be noted that the above calculations assume that an individual is exposed to the highest annual concentration continuously for a period of 70 years.

Based upon the above, the levels of HAPs in the ambient air due to emissions from the GTL Energy facility are expected to be well below the levels allowed by the Air Toxics Policy.

CDT:saj